PHYTOTOXICOLOGY ASSESSMENT SURVEY IN THE VICINITY OF BRAMPTON BRICK LIMITED

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Environment Ontario

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PHYTOTOXICOLOGY ASSESSMENT SURVEY IN THE VICINITY OF BRAMPTON BRICK LIMITED

514 Main Street North
Brampton, Ontario

on September 21 and 22, 1987

Report: ARB-119-88-PHYTO

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INTRODUCTION

Vegetation injury assessment surveys have been carried out around the Brampton Brick Ltd. brickworks at 514 Main Street North in Brampton continuously since 1973, with the exception of 1978. Gaseous hydrogen fluoride (HF) is emitted to atmosphere from the brick kilns during firing. Each year, near the middle of September, sensitive vegetation was examined for fluoride induced injury and samples of tree foliage were collected for fluoride analysis. From 1973 to 1981 trace amounts of typical fluoride injury were observed on leaves of sensitive tree species at sites within 300 meters of the brickwork's property perimeter. Since 1982 however, no visible fluoride injury has been observed on fluoride sensitive vegetation.

SURVEY DESIGN

On September 21 and 22, 1987 Messrs. D.S. Harper and P.C. McGovern examined foliage of sensitive plant species for fluoride injury at 11 sites within 2 km of the brickworks. At each site samples of tree (usually maple) foliage were collected in duplicate. The samples were collected into clean plastic bags for delivery to the Phytotoxicology Section vegetation processing laboratory in Toronto. Samples were oven dried at 60°C, ground and submitted to the Laboratory Service Branch, Inorganic Trace Contaminants Section for fluoride analysis.

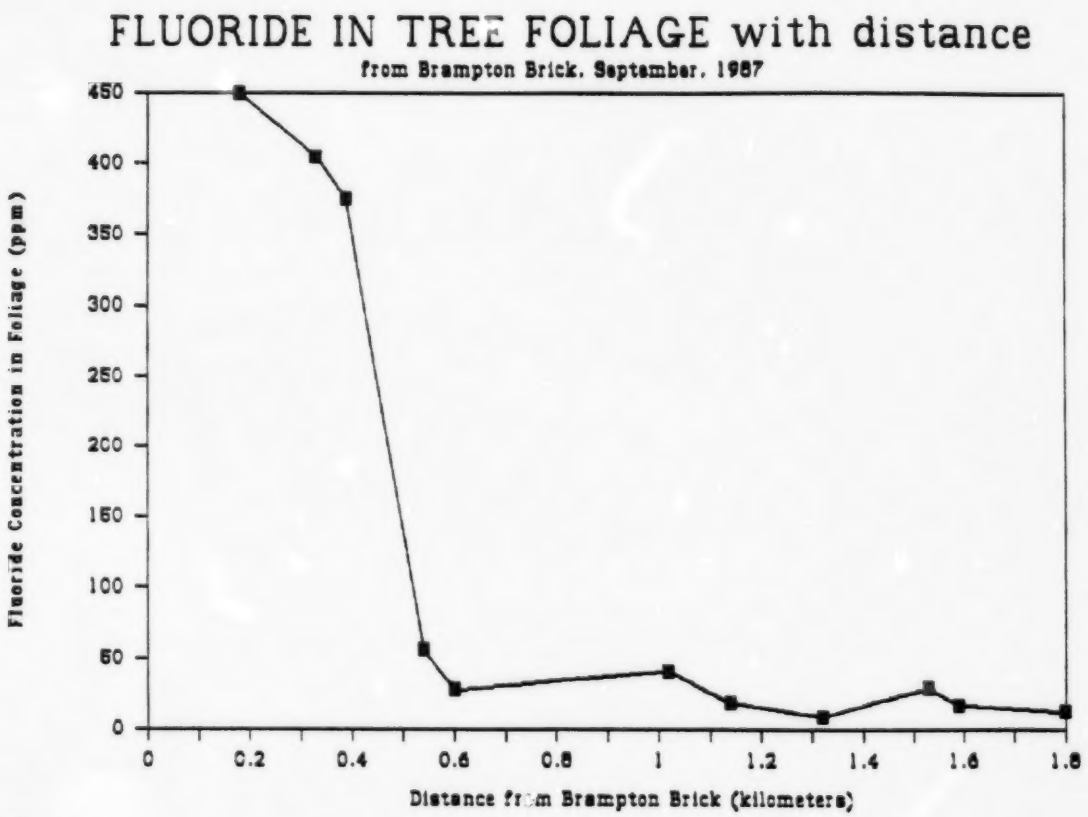
OBSERVATIONS AND ANALYTICAL RESULTS

Fluoride injury, typified by a marginal necrosis on the oldest leaves, was observed on Manitoba Maple at sampling site 8 for the first time since 1981. No fluoride-induced foliar injury was observed on vegetation elsewhere in the survey area.

The 1987 results of the fluoride analyses for tree foliage are presented in Table 1, together with comparable fluoride analyses for 1981 to 1986. In general, fluoride concentrations in foliage were as high, or higher in 1987 than at any time during the 1980's. At the three sampling sites closest to the brickworks (sites 1, 8 and 11) fluoride concentrations were over ten times the Phytotoxicology Section's Upper Limit of Normal for tree foliage growing in an urban environment. A description of the derivation of the ULN's is attached as Appendix 1. Fluoride in vegetation exceeded the ULN for fluoride at 5 sites in 1987 compared to 3 in 1986, 4 in 1985 and 5 in 1984.

As in all years in which this survey was conducted, fluoride concentrations in tree foliage declined with increasing distance from the brickworks. The relationship between fluoride concentration and distance from Brampton Brick is shown graphically in Figure 2 below.

FIGURE 2



SUMMARY

Fluoride induced injury was observed on foliage of maple trees growing near Brampton Brick, 514 Main Street North, Brampton, for the first time since 1981. Fluoride concentrations, in excess of the Phytotoxicology Section Upper Limit of Normal for fluoride in urban tree foliage, were found in maple foliage samples from 5 sites within 1 km of the brickworks. Fluoride in tree foliage declined with distance from the brickworks.

TABLE 1

Results of Analyses of Tree Foliage Collected near Brampton Brick Limited, Brampton on September 21 and 22, 1987

Sampling Location (station number)	Tree Species Sampled	Results of Analysis* of Tree Foliage for Fluoride, by Sampling Site and Year, 1981 to 1987 (ppm, dry weight)						
		1981	1982	1983	1984	1985	1986	1987
1	silver maple	(88)	(118)	(47)	(101)	(124)	(105)	(405)
3	Manitoba maple	(46)	(52)	9	24	32	21	19
4	Manitoba maple	34	(58)	6	24	13	7	9
5	Manitoba maple	(36)	13	8	11	15	12	28
6	Manitoba maple	29	(40)	10	(40)	33	15	(41)
7	sugar maple	(44)	(62)	20	(40)	(44)	25	(56)
8	Manitoba maple	(402)	(152)	(88)	(387)	(291)	(310)	(450)
9	white ash	21	8	7	8	6	5	13
10	Manitoba maple	20	12	7	13	10	10	17
11	Manitoba maple	(297)	(235)	(116)	(151)	(213)	(195)	(375)
13	Manitoba maple	34	(60)	11	21	15	22	29
Phytotox. Upper Limits of Normal	Urban Tree Foliage	35	35	35	35	35	35	35

* circled analytical values were in excess of the Phytotoxicology ULN for fluoride in urban tree and shrub foliage

APPENDIX I

Derivation and Significance of MOE "Upper Limits of Normal" Contaminant Guidelines

The MOE "upper limits of normal" contaminant guidelines essentially represent the expected maximum concentration of contaminants in surface soil (non-agricultural), foliage (tree and shrub), grass, moss bags and or snow from areas of Ontario not subject to the influence of point sources of emissions. "Urban" guidelines are based upon samples collected from centers of minimum 10,000 population. "Rural" guidelines are based upon samples collected from non-built-up areas. Samples were collected by MOE personnel using standard sampling techniques (ref: Ministry of the Environment, 1983. Field Investigation Manual. Phytotoxicology Sectior - Air Resources Branch: Technical Support Sections - NE and NW Regions). Chemical analyses were performed by the MOE Laboratory Services Branch.

The guidelines were calculated by taking the arithmetic mean of available analytical data and adding three standard deviations of the mean. For those distributions that are "normal", 99% of all contaminant levels in samples from "background" locations (i.e. not affected by point sources nor agricultural activities) will lie below these upper limits of normal. For those distributions that are non-normal, the calculated upper limits of normal will not actually equal the 99th percentile, but nevertheless they lie within the observed upper range of MOE results for Ontario samples.

Due to the large variability in element concentrations which may be present across Ontario, even in background data, control samples should always be collected. This is particularly important for soils, which may show large regional variations in element composition due to difference in parent material. Species of vegetation which naturally accumulate high levels of an element also may be encountered.

It is stressed that these guidelines do not represent maximum desirable or allowable levels of contaminants. Rather, they serve as levels which, if exceeded, would prompt further investigation on a case by case basis to determine the significance, if any, of the above normal concentration(s). Concentrations which exceed the guidelines are not necessarily toxic to plants, animals or man. Concentrations which are below the guidelines are not known to be toxic.

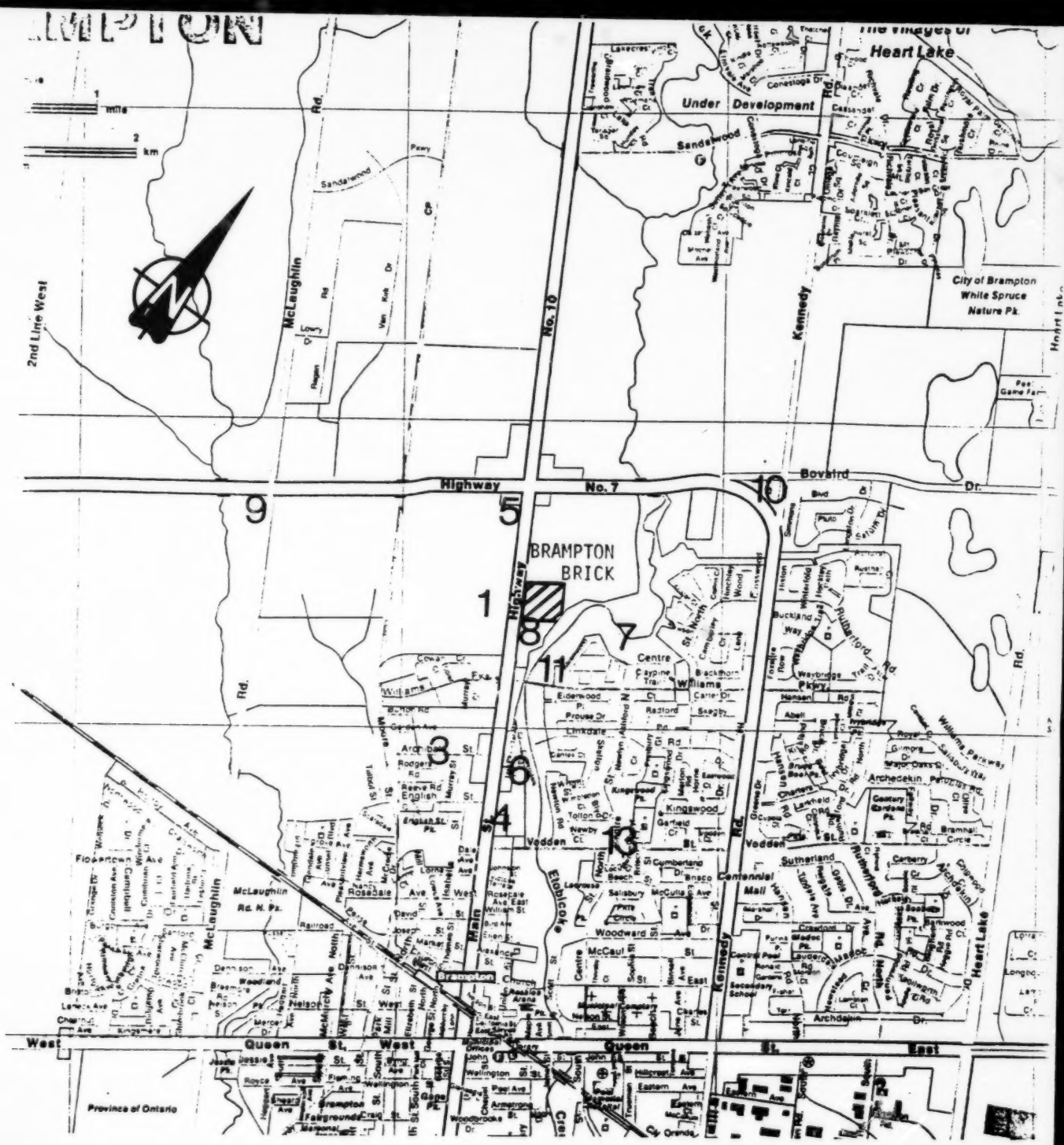


FIGURE 1

MAP OF THE VICINITY OF BRAMPTON BRICK LTD., 514 MAIN STREET NORTH, BRAMPTON SHOWING THE LOCATIONS OF 11 VEGETATION SAMPLING SITES, SEPTEMBER, 1987

0 600 1200 1800

Approximate Scale (meters)